

## ARCTIC OCEAN 43

Ice Shield Velocity

10

<0.01

metres/day

## **Greenland Ice Sheet**

As part of the Arctic region, the Greenland Ice Sheet is the second largest in the world. Covering approximately 1.7 million square kilometres, which is 80% of the area of the island, it is one of the largest repositories of freshwater ice and plays an important role with respect to global climate and sea level. The Greenland Ice Sheet reaches a thickness exceeding 3 kilometres, harbouring an estimated volume of ice equivalent to roughly 7.2 metres of global sea level rise. Its sheer mass exerts a significant influence on regional weather patterns and ocean currents.

Scientific research utilizing satellite observations, ice core samples, and climate models has revealed clear trends in the Greenland Ice Sheet's dynamics. Accelerated melting driven by rising temperatures has led to increased runoff and iceberg calving, contributing to rising sea levels worldwide. The loss of ice mass from Greenland has been identified as one of the primary drivers of global sea level rise. Feedback mechanisms exacerbate the ice sheet's vulnerability to climate change. As ice melts and exposes darker surfaces, such as rock or water, the albedo effect intensifies, causing more solar radiation to be absorbed and accelerating further melting in a so-called positive feedback loop.

Satellite altimetry measurements provide insights into changes in ice sheet elevation, allowing to monitor variations in ice thickness. This data revealed thinning and mass loss particularly along Greenland's periphery, where warmer ocean waters accelerate ice melt from below. Satellite imagery offers information on surface features and melt patterns across the ice sheet. High-resolution optical and radar images capture details such as crevasses, melt ponds, and supraglacial lakes, which influence the ice sheet's development. Radar satellite remote sensing enables the monitoring of ice sheet movement through techniques like interferometric synthetic aperture radar (InSAR). By measuring precise changes in surface elevation, InSAR provides insights into ice flow velocities.



 Greenland, Cumulative ice loss and its contribution to the global sea level rise (Data source: IMBIE Credit: ESA/NASA).



7. Greenland, Ice sheet velocity in 2020 derived from radar satellite data. Data: Sentinel-1.



8. False-colour infrared image of Jakobshavn Isbrae, Greenland. The overlay shows the retreat of the glacier edge since 1850. Data: Sentinel-2, 2023-09-01



9. True colour image of the edge of a glacier south of Jakobshavn Isbrae, Greenland, with calving icebergs. Data: Sentinel-2, 2023-09-01.